

REMARKS

In the Office Action the Examiner noted that claims 1-3 and 8 were pending in the application and the Examiner rejected all claims. By this Amendment, various claims have been amended. Thus, claims 1-3 and 8 are pending in the application. The Examiner's rejections are traversed below.

The Rejection

In item 4 on pages 2-5 of the Office Action the Examiner rejected claims 1-3 and 8 as unpatentable over U.S. Patent 4,403,162 to Pallaro in view of Japanese Patent Publication 54-132701 to Takashi.

The Present Invention

The present invention as set forth, for example, in claim 1, is directed to an electric motor which includes a stator core having slots and coils arranged along the slots of the stator core to form coil edges projecting from ends of the stator core. Insulation sheets insulate proximal portions of the coil edges. Each of the insulation sheets has a folded portion folding one or more coils of the same phase and inserting portions inserted into the slot or slots of the stator core. The inserting portions have distal ends extending from the slot or slots inside the stator core to be positioned away from a centerline of the folding portion, so that the insulation sheets are fixed by drawing the distal ends from inside of the stator core.

The Prior Art

The Pallaro Reference

The Pallaro reference is directed to an insulating element for electric motor windings. Referring to Figures 1-3, motor windings are separated by insulating elements of die-cut sheet material 26. Each element 26 includes a pair of end panels 28 and 30 interconnected by a series of a parallel strips 32. The strips 32 are intended to extend within the slots 14 of the armature 10 to separate the active parts of the two windings and the end panels 28 and 30 are intended to separate the end portions of the windings. An insulated sleeve 34 is integrally formed with the element 36 on the end panel 28. The sleeve receives one of the joints constituted by one of the cable clips 20 (see column 2, line 57 to column 3, line 13).

The Takashi Reference

The Takashi reference discloses use of a band state insulator to insulate a coil end part. Band state insulator 24 is inserted along all of the circumference of the coil end part 22 and is fixed by binding yarn 25 together with the coil, insulator 23 with legs 231 which are inserted in the slot at the part on which each phase coil is contacted in the neighborhood of an outlet of the slot.

The undersigned has been advised that lines 1-10 of the lower right column of page 2 of the Takashi reference are translated as follows:

This insulator 23, as shown in Fig. 3 comprises legs 231 for insertion into stator core slots 21S and a body part 232. The body part 232 has an area capable of covering a contacting region of a plurality of different phase coils, and the number of the insertion legs 231 extending from the body part is two or three in general, which is two in this embodiment. Further, the length ℓ of the body part 232 along a circumferential direction of the stator core corresponds to 3 to 6 pitches of stator core slots, which corresponds to 3 pitches of the stator core slots in this embodiment.

The undersigned has been advised that page 2 from line 5 of the lower left column to line 19 of the lower right column describe the insulator 23 as follows:

The stator 2 comprises a stator core 21 and a stator coil 22, and the stator coil 22 comprises a u-phase coil 22u, a v-phase coil 22v and a w-phase coil 22w.

Since deterioration of insulation occurs due to corona discharge between coils of respective phases in applying a high voltage, it is necessary to make insulation between the u-phase and the v-phase and between the v-phase and the w-phase. According to the present invention, the inter-phase insulation is performed by using an insulator 23 with legs and a band-state insulator 24. The band-state insulator 24 is a known insulator and bound with the coil over the whole periphery by a coil-binding string 25 in retaining

the stator coil 22. As stated above, the band-state insulator is lifted outwardly of the stator core 21 to cause contacts between the coils of different phases. Thus, the insulator 23 is inserted in order to prevent the contacts between the coils of different phases.

This insulator 23, as shown in FIG. 3, comprises legs 231 for insertion into stator core slots 21s, and a body part 232. The body part 232 has an area capable of covering a contacting region of a plurality of different phase coils, and the number of the insertion legs 231 extending from the body part is two or three in general, which is two in this embodiment. Further, the length l of the body part 232 along a circumferential direction of the stator core corresponds to 3 to 6 pitches of stator core slots, which corresponds to 3 pitches of the stator core slots in this embodiment.

After the band-state insulator 24 as described is inserted, a plurality of insulators 23 with legs are inserted between the coils of different phases with insertion legs thereof into the stator core slots, so that contacts between the u-phase and the v-phase and between the v-phase and the w-phase in the periphery where the coils extend out of the stator core slots are prevented, therefore the corona discharge phenomenon in applying a high voltage can be reduced and the deterioration of insulation is prevented to thus elongate life of the product.

Thus, Takahashi shows an insulator 23 having legs 231 in Fig. 3C, but the legs 231 are provided to be simply inserted into the slots 21S of the stator core 21. There is no teaching or suggestion that teach of the insulation sheets has inserting portions inserted in the slots of the stator core, nor is there any disclosure of the inserting portions having distal ends extending from the slots inside the stator core, so that the insulation sheets are adapted to be fixed by drawing the distal ends from inside of the stator core.

The Present Claimed Invention Patentably Distinguishes Over the Prior Art

Claim 1, as amended specifies an electric motor which includes:

insulation sheets for insulating proximal portions of the coil edges, each of said insulation sheets having a folding portion folding one or more coils of the same phase and inserting portions inserted into the slot or slots of said stator core, said inserting portions having distal ends extending from the slot or slots inside said stator core to be positioned away from a centerline of the folding portion, so that said insulation sheets are fixed by drawing the distal ends from inside of said stator core.

It is submitted that these features are not taught or suggested by the prior art. Contrary to the Examiner's assertion in item 6 on pages 4 and 5 of the Office Action, applicants are unable to locate any disclosure in Takashi of drawing distal ends from inside of the stator core. The Examiner references pulling the end of the leg 231 from the top to the bottom of the slot inside the stator core. However, applicants are unable to locate any language in Takashi corresponding to this assertion. As an alternative, the Examiner appears to take the position that the claim language is functional. Applicants have amended claim 1 in order to emphasize the structural features which allow the distal ends of the insulating sheets to be pulled from the inside of the stator core to provide improved insulation of proximal portions of coils of the stator.

Applicants also submit that since the legs 231 of the insulator 23 extend in a direction of insertion of the insulator 23 in Takashi, it is impossible to draw distal ends of the legs 231 from inside of the stator core. Claim 1 as amended recites that the distal ends of the inserting portions are positioned away from the center line as illustrated, for example, in Figure 1. Thus, the structural feature of the insertion sheet which enables the drawing of the distal ends from the inside of the stator core is clearly recited in claim 1.

Applicants also maintain that one of ordinary skill would not have been led to combine the teachings of Pallaro and Takashi in the manner suggested by the Examiner. In particular, in Pallaro, parallel strips 32 extend within slots 14 of the armature 10 to separate the active parts of windings. Therefore, it is submitted that one of ordinary skill would not have been led to attach additional distal ends to the insulator in Pallaro as suggested by Takashi. It is also submitted that the Examiner's line of reasoning (set forth below) for combining the teachings of Pallaro and Takashi is insufficient:

Doing so would make insulation to be sure and improve the reliability of electric motor. (Page 3 of Office Action.)

It is submitted that this line of reasoning comes only from the subject application and not from the prior art. Therefore it is submitted that the Examiner's rejection is improper and should be withdrawn. In items 7 and 8 on page 5 of the Office Action, the Examiner takes the position that Pallaro and Takashi are in the same field and that the Abstract of Takashi states that the purpose of making his electric motor is "to make phase insulation to be sure, and improve the reliability by using band state insulator and a plurality number of insulators with legs, and making phase insulation on the coil end part." However, this statement does not negate the fact that one of skill would not have been led to attach additional distal ends to the insulator in Pallaro because Pallaro already includes strips 332 which extend within slots 14 of the armature 10.

For the above reasons, it is submitted that claim 1 patentably distinguishes over the prior art.

Claims 2 is directed to an electric motor which includes:

insulation sheets insulating proximal portions of the coil edges, each of said insulation sheets having a folding portion folding one or more coils of the same phase and two inserting portions extending from the folding portion so that respective distal ends are positioned away from a centerline of the folding portion,

wherein the coils of the same phase are folded by the folding portions of said insulation sheets, and the inserting portions are inserted into the slots of said stator core, said inserting portions having distal ends extending from the slots inside said stator core, so that said insulation sheets are adapted to be fixed by drawing the distal ends from inside of said stator core to thereby insulate the coils of the same phase from coils of different phases.

Therefore, it is submitted that claim 2 patentably distinguishes over the prior art.

Claim 3 depends from claim 1 and includes all of the features of that claim plus additional features which are not taught or suggested by the prior art. Therefore, it is submitted that claim 3 patentably distinguishes over the prior art.

Claim 8 is directed to an electric motor which includes:

insulators insulating proximal portions of the coil edges,
each of said insulators folded around one or more coils, said
insulators having inserting portions inserted into at least one slot of
said stator core, said inserting portions having distal ends
extending from the at least one slot inside said stator core, so that
said insulators are adapted to be fixed by drawing the distal ends
from inside of said stator core.

Therefore, it is submitted that claim 8 patentably distinguishes over the prior art.

Summary

It is submitted that none of the references either taken alone or in combination, teach the present claimed invention. Thus, claims 1-3 and 8 are deemed to be in a condition for allowance. Reconsideration of the claims and an early notice of allowance are earnestly solicited.

Respectfully submitted,

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